

A graphic showing several interlocking puzzle pieces in shades of blue and white. The pieces are arranged in a way that suggests a larger image is being assembled. The background is dark blue with a subtle pattern of binary code (0s and 1s).

# Defined STEM in the classroom

## Top Ten Ways to Use Defined STEM in the Classroom

Based upon feedback received from classroom teachers, department heads, administrators, online learning coordinators, and families the following opportunities for implementation and performance assessment have proved extremely valuable as part of the teaching and learning process. These ideas are presented in no particular order.

### **Culminating Unit Activity:**

The performance task presents a problem that is tied to a primary academic standard. The task connects with numerous other academic standards as well. The task contains a number of products that require the student to demonstrate understandings of the academic standard(s). Additionally, through the task the students are answering one or more essential questions that address a big idea. Rubrics are contained within the task to help the educator assess student understanding. The task can serve as the primary or supplementary assessment for student knowledge and skill development.



### **Gifted Education:**

The performance task and associated products can be utilized to enhance a gifted program and address content area learning while providing the ability for student autonomy. The videos and learning connections provide background information to help the student gain a foundational understanding of specific skills, content, and applications are to be addressed. The product development process aligns with numerous multiple intelligences and has the student working to demonstrate understanding across multiple forms of media. Additionally, many of the products created will require the utilization of technology. The tasks are strongly aligned with 21st century content and skill development. Through the completion of a performance task and associated learning, students can meet the requirements of their gifted education independently or through teacher-guided facilitation.



## Differentiated Instruction:

The performance task can serve as an authentic assessment that can be utilized by taking into consideration the many different ways that students learn. Through the utilization of the videos, simulations, and classroom teaching, this experience provides contextual learning through a variety of learning opportunities. This process engages students in their own learning through the use of activities and product development thus motivating and challenging students through meaningful and relevant experiences.

Each performance task provides many opportunities for students to demonstrate understanding. Since the “one size fits all” classroom minimizes student success, both the performance task and associated content have been designed to provide opportunities for all learners based upon the teacher’s knowledge of his/her students. Supporting the performance task are videos, simulations, and learning connections meant to support mixed ability levels, interests, and foundational knowledge.

The products within each task are designed using the multiple intelligences. The products provide varying means of conducting student assessment. Based upon each individual learner the educator can make appropriate decisions for assessment through product development.

These considerations may include:

- having a student complete all products within a task;
- having students complete a number of products based upon student interest;
- having a student complete certain products based upon the educator’s decision;
- having student work as part of a cooperative group to complete the products; or
- having students complete products based upon the strength of their multiple intelligences.

Defined STEM provides different pathways through these experiences to meet the needs of diverse learners.





### **Interdisciplinary Unit/ Cross-Curricular Teaching:**

The performance task and associated content provide opportunities for students to build their knowledge and skills and understand how the academic areas connect. The tasks provide great opportunities for team teaching and/or culminating activities that can be shared across subjects. Through product creation students will be required to utilize technology, the arts, and language arts to complete a majority of tasks with STEM as the central content. Through the application of 21st century learning and skills, students are engaging in a holistic learning experience designed to help them succeed beyond school.

### **Webb's Depth of Knowledge:**

Higher order thinking skills, critical thinking skills, and problem solving skills are attainable through the utilization of Defined STEM performance tasks, simulations and connected content. The products the student constructs with each task can serve to extend the depth and rigor of the learning experience, as well as promote higher level thought processes through experiential learning. Based upon Webb's Depth of Knowledge, Level 3 instruction addresses strategic thinking through student opportunities to assess, revise, critique, assessment, investigate and construct. Level 4 instruction addresses extended thinking through student opportunities to design, create, analyze and synthesis.

### **Creating Links between Standards-based Teaching and Learning and 21st Century Skills:**

National and state academic standards are content and performance based standards. Through Defined STEM, educators are able to help students achieve proficiency in STEM standards through "real world" applications of content and performance. The content and performance task strongly align academic standards with 21st century Learning and Innovation Skills. The experiential learning opportunities require students to problem solve and think critically while applying the content and skills of the academic standards. Students can work individually, in small groups and/or in large groups thus increasing the opportunities for communication and collaboration. The experiences encourage the students to be creative and innovative in their thinking.



## **Independent Learning:**

The performance task and associated products can be utilized based upon student learning level. The videos and learning connections can provide opportunities for students to link their learning with real-life applications and potential careers. The products within the tasks can be adapted based upon the multiple intelligences or the needs of the individual student. The tasks are strongly aligned with 21st century content and skill development and require the use of technology as part of the product development process. They can help provide motivation for student learning as well help students understand why they need to learn certain content and skills. The inclusion of simulations can help the student understand concepts in an independent environment. Educators may facilitate the learning experience, serve as a guide to student learning, or allow the students to work and complete the task independently.

## **Project Based Learning:**

Each performance task contains between three and six products that allow the student demonstrate his/her understanding of content, concepts, and skills. Simulations in many of the tasks extend student learning and require students to solve problems. The tasks are aligned with academic standards and 21st century learning and innovation skills. The learning experience focuses on student-centered inquiry and group learning with the teacher acting as a facilitator. Many of the potential products require students to use technology as part of product creation. Students are required to create their own artifacts, individually or as part of a group, as a representation of what they have learned through the teaching and learning process.



**Summative Assessment:**

The performance task and connected content may serve as a summative assessment to monitor student understanding. The task would be best utilized as a culminating activity as part of a larger assessment process that includes formative assessment and more traditional summative assessments. As traditional testing methods measure content and concept knowledge, the performance task requires students to demonstrate understanding of content and concept relevance as part of a holistic learning application.

**Constructivist Teaching:**

A constructivist approach to learning involves student engagement that is based upon knowledge and skills that a student already possesses. This approach considers actively engaged students as effective learning. Through the utilization of the Defined STEM content, educators can facilitate student learning through guided discovery involving activities, questioning, and collaboration.

The student-centered classroom provides interactive activities that are driven by product development by cooperative learning groups. The performance task and associated content present these types of activities through the utilization of 21st century skills and the construction of new knowledge. The learning experience requires students to understand how specific content and concepts fit into global concepts and themes.



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